

Atmos. Chem. Phys. Discuss., author comment AC1  
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## Reply on RC1

Hao Yin et al.

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Author comment on "Spaceborne tropospheric nitrogen dioxide (NO<sub>2</sub>) observations from 2005–2020 over the Yangtze River Delta (YRD), China: variabilities, implications, and drivers" by Hao Yin et al., Atmos. Chem. Phys. Discuss.,  
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### Response to Referee #1:

Thanks very much for your comments, suggestions and recommendation with respect to improve this paper. The responses to all your comments are listed below.

This manuscript investigates the long-term variabilities of tropospheric NO<sub>2</sub> VCDs from 2005–2020 using OMI satellite data product over the Yangtze River Delta (YRD), one of the most densely populated and highly industrialized city clusters in China. The authors also quantify the contributions of meteorology and anthropogenic emissions to the long-term variabilities of tropospheric NO<sub>2</sub> VCDs in the major megacities over YRD. They conclude that the inter-annual variabilities of tropospheric NO<sub>2</sub> VCDs from 2005 to 2020 over the YRD can be divided into two stages, i.e., an overall increasing trend from 2005 to 2011 and an overall decreasing trend from 2011 to 2020. This is an interesting study and the majority of the work are creative. This manuscript is well written, structured and analyzed convincingly, and its topic fits well within the scope of ACP. I think that this manuscript can improve our knowledge with respect to long-term evolutions of economic and social development, anthropogenic emission over the YRD, and could be of interest to the general atmospheric science community. Minor revisions are recommended.

**Response:** All your comments listed below have been addressed. Please check the point by point response as follows.

### General comments:

**Comment [1]:** Please provide more detailed descriptions about the YRD region, such as the population, number of cities, area of the region, etc, over Zhejiang, Anhui and Jiangsu Province. This would help the reader understand the reason that YRD region is one of the most densely populated and highly industrialized city clusters in China.

**Response:** Thanks for your suggestion. In our revised version, we have added content to Table1 including the detailed descriptions of each province over the YRD region. Please check the marked up file for details.

**Comment [2]:** In section 3.3 and Figure 5, the authors state that "For each city, the CNMEC ground level NO<sub>2</sub> measurements nearest to the OMI ground grid were included for comparison." In each city, there are a number of CNMEC ground stations. However, the

authors present comparisons of satellite and ground-based observations for each city. Whether the authors averaged all observed values or some other method? The authors should state the detailed of this process in section 6.

**Response:** Thanks for your suggestion. In this study, ground level NO<sub>2</sub> concentrations were taken as the average of all CNMEC stations in each city. The Tro\_NO<sub>2</sub> values were taken as the average of all OMI observed grids within the scope of each city. We have modified the corresponding content in Line 330-332, section 3.3. Please check the marked up file for details.

**Detailed comments:**

**Comment [1]:** The phrase “tropospheric NO<sub>2</sub> VCDs” is too cumbersome in this manuscript, and please change it to a simple symbol, such as “Tro\_NO<sub>2</sub>” or similar.

**Response:** Done, we changed “ tropospheric NO<sub>2</sub> VCDs” to “NO<sub>2</sub> VCD<sub>trop</sub>”. Please check the marked up file for details.

**Comment [2]:** Please include a figure about the monthly average of surface temperature in main cities over YRD in the supplement, same as figure S6.

**Response:** Thanks for your suggestion. We have added figure S9 including the monthly average of surface temperature in main cities over YRD in the supplement. Please check the marked up file for details.

**Comment [3]:** Line 37, “... inter annual ...” should be “... inter-annual ...”.

**Response:** Done. Please check the marked up file for details.

**Comment [4]:** Line 41, “... which cause ...” should be “... which causes ...”.

**Response:** Done. Please check the marked up file for details.

**Comment [5]:** Line 58, “... biogeochemical reaction ...” should be “... the biogeochemical reactions ...”

**Response:** Done. Please check the marked up file for details.

**Comment [6]:** Line 85, “the rapid developing regions” should be “the rapidly developing regions”.

**Response:** Done. Please check the marked up file for details.

**Comment [7]:** Line 102, “policies” should be “policies”.

**Response:** Done. Please check the marked up file for details.

**Comment [8]:** Line 259, “Except ...” should be “Except for ...”.

**Response:** Done. Please check the marked up file for details.

**Comment [9]:** Line 346, “agreements” should be “agreement”.

**Response:** Done. Please check the marked up file for details.

**Comment [10]:** Line 352, “characterized” should be “is characterized”

**Response:** Done. Please check the marked up file for details.

**Comment [11]:** Line 395, "bellow" should be "below".

**Response:** Done. Please check the marked up file for details.

**Comment [12]:** Line 465, "relative" should be "relatively".

**Response:** Done. Please check the marked up file for details.

**Comment [13]:** The usage of "emission" and "emissions" is sometimes misleading, please use it consistently.

**Response:** Done. Please check the marked up file for details.

**Comment [14]:** Please add the units for each meteorological parameter in table 2.

**Response:** Done. Please check table 3 in revised version.

**Comment [15]:** I cannot list all technical errors as above. I thus suggest that the authors should check all grammatical errors throughout the manuscript and correct accordingly.

**Response:** Done. Please check the marked up file for details.

**Comment [16]:** Please check the format of each reference and make sure it follows the ACP format.

**Response:** Done. Please check the marked up file for details.